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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/643,461

08/18/2003

Qi Xiang

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12/09/2008

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EXAMINER

NGUYEN, JOSEPH H

ART UNIT

PAPER NUMBER

2815

MAIL DATE

DELIVERY MODE

12/09/2008

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/643,461	<b>Applicant(s)</b> XIANG ET AL.	
	<b>Examiner</b> JOSEPH NGUYEN	<b>Art Unit</b> 2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 08 November 2008.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-3, 6, 7, 9, 10, 13, 15 and 19 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3, 6-7, 9-10, 13, 15, 19 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 August 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114 was filed in this application after a decision by the Board of Patent Appeals and Interferences, but before the filing of a Notice of Appeal to the Court of Appeals for the Federal Circuit or the commencement of a civil action. Since this application is eligible for continued examination under 37 CFR 1.114 and the fee set forth in 37 CFR 1.17(e) has been timely paid, the appeal has been withdrawn pursuant to 37 CFR 1.114 and prosecution in this application has been reopened pursuant to 37 CFR 1.114. Applicant's submission filed on 11/06/2008 has been entered.

### ***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1-3, 6, 9-10 and 15 are rejected under 35 U.S.C. 102(b) as being anticipated by Kubo et al. (U.S. Patent No. 6,190,975).

Regarding claim 1, Kubo et al. discloses in figure 1 a FET situated over a substrate (10), said FET comprising a channel (14) situated in said substrate; a first gate dielectric (19) situated over said channel, said first gate dielectric having a first coefficient of thermal expansion; a first gate electrode (18) situated over said first gate dielectric, said first gate electrode having a second coefficient of thermal expansion; wherein said first gate dielectric having said first coefficient of thermal expansion and said first gate electrode having said second coefficient of thermal expansion so as to cause a strain in said channel, thereby increasing carrier mobility in said FET.

It is noted that the first gate dielectric is made of silicon oxide and the first gate electrode made of polysilicon. Thus, the first coefficient of thermal expansion should be different from the second coefficient of thermal expansion since the coefficient of thermal expansion depends on the material (See Wolf et al.), and this thermal expansion difference would naturally cause a strain in the channel and thereby increase mobility in said FET. The term “selected to have” is merely the intended use. The difference in the first coefficient of thermal expansion and the second coefficient of thermal expansion inherently causes a strain in the channel and thereby increases carrier mobility in said FET.

Regarding claim 2, Kubo et al. discloses said second coefficient of thermal expansion is greater than said first coefficient of thermal expansion (See Wolf et al.).

Regarding claim 3, Kubo et al. discloses in figure 1 said increase in said carrier mobility is caused by a tensile a tensile strain created in said channel 14.

Regarding claim 6, Kubo et al. discloses on figure 1 said FET is a PFET.

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Regarding claims 9-10, 15 and 16, in a similar manner as the rejection of claims 1-3 and 6 above, Kubo et al. discloses in figure 1 all the structures set forth in the claims 9-10 and 15.

***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 7, 13, 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kubo et al. as applied to claims 1, 9 and 15 above.

Regarding claims 7, 13 and 19, Kubo et al. disclose in figure 1 substantially all the structure set forth in the claimed invention except said first coefficient of thermal expansion being greater than said second coefficient of thermal expansion. However, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify Kubo et al. by having said first coefficient of thermal expansion being greater than said second coefficient of thermal expansion for the purpose of improving the performance of a FET device, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

***Response to Arguments***

6. Applicant's arguments filed 11/06/2008 have been fully considered but they are not persuasive.

With respect to claims 1, 9 and 15, applicant argues Kubo et al. does not disclose a first gate dielectric having a first coefficient of thermal expansion and a first gate electrode having a second coefficient of thermal expansion, where the first gate dielectric is selected to have the first coefficient of thermal expansion and the first gate electrode is selected to have the second coefficient of thermal expansion so as to cause a strain in the channel, thereby increasing carrier mobility in the FET. However, it is well known in the semiconductor area that a semiconductor material constitutes a coefficient of thermal expansion. Thus, the first gate dielectric 19 formed of silicon oxide (col. 9, lines 48-49) should have a coefficient of thermal expansion and the first gate electrode 18 formed of polysilicon (col. 12, lines 64-66) should have a coefficient of thermal expansion. Since a coefficient of thermal expansion depends upon a material (See Exhibit A, Wolf, et al.) and silicon oxide and polysilicon are materially different from each other, their coefficients of thermal expansion should be different from each other, and this thermal expansion difference naturally causes a strain in the channel, thereby increasing carrier mobility in the FET. In other words, Kubo et al. discloses in figure 1 the first gate dielectric and the first gate electrode meet the claimed feature herein. Lastly, since the rejection of base claims 1, 9 and 15 is proper, the rejection of claims 2, 3, 6, 7, 10, 13 and 19 still stands.

***Conclusion***

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joseph Nguyen whose telephone number is (571) 272-1734. The examiner can normally be reached on Monday-Friday, 7:30 am- 4:30 pm. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (571) 272-1664. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306 for regular communications.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Joseph Nguyen/

Examiner, Art Unit 2815

/Kenneth A Parker/

Supervisory Patent Examiner, Art Unit 2815